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RECENTLY PUBLISHED RESEARCH OF THE LENINGRAD AFFILIATE, STATE SCIENTIFIC-RESEARCH INSTITUTE OF MINERAL AND CHEMICAL RAW MATERIALS

"Rate of Solution of Sodium Chloride and Potassium Chloride Crystals," A. B. Zdanovskiy, Leningrad Affiliate, State Sci-Res Inst of Mineral and Chemical Raw Materials

"Zhur Fiz Khimii" Vol 20, 1946, pp 579-86

Crystals weighing 0.3-2.4 g freely fall in the rising solvent so that they steadily remain in the middle of the reaction vessel. In this arrangement crystal cubes preserve an approximately cubical shape. If the mass of a crystal decreases from M_0 to M_1 g within t minimum, c is the concentration of the saturated solution, c_x the concentration of the flowing liquid (g/1), and d the density of the crystal, then the constant of solution $k = d^{2/3} (M_0^{1/3} - M_1^{1/3})/2t(c - cx)$. Crystals of different sizes and different rates of flow give k values within ± 3%. Crystals from different sources give identical k values. Only red sylvite dissolved too slowly because of the presence of insoluble salts in its surface. The values of k of NaCl are identical for H_2O and 20% NaCl below 60°, and the values of k for KCl are identical in H_2O and 20% KCl in the whole temperature range studied. For NaCl in H_2O $k \times 10^6$ is 252, 424, 950, 1,670 at 2.0°, 18.1°, 57.2°, and 95.0°, respectively. For KCl in H_2O $k \times 10^6$ is 392, 706, and 1,260, and 2,030 at 2.2°, 25.0°, 60.0°, and 98.5°, respectively. Approximately, log k = A -- (B/T), T being temperature and A and B constants. Gapon's equation k = constant $a\sqrt{T}$ is not valid. There is a linear relation between log k for NaCl and log k for KCl.

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"The Role of the Interphase Solution in the Kinetics of the Solution of Salts," A. B. Zdanovskiy, Leningrad Affiliate, State Inst of Mineral and Chem Raw Materials

"Zhur Obshch Khimii" Vol 20, 1946, pp 869-80

For the rate of solution of a crystal the expression $KD_oS(C_e - C_s)/(D_o\ k\delta\eta)$ is derived. In it k is the velocity constant of the chemical solution, S is the surface, η the viscosity of the solution next to the crystal, D_o the diffusion coefficient for the combined diffusion of the salt from, and the solvent toward, the crystal, δ the thickness of the surface layer, C_e the concentration of the saturated solution, and C_s that of the solvent. Experiments using the previous technique were made on NaCl dissolving in various solutions of NaCl, KCl, $MgCl_2$, and Na_2SO_4, and of KCl in solutions of NaCl and KCl, all at 25°, as well as on NaCl and KCl dissolving at 100° each in solutions of both NaCl and KCl. The factor $kD_o/(D_o + K\delta\eta)$, when C_e and C_s are expressed in g/cc is, e.g., 0.504-0.51 and 1.63-1.75 cm/min for NaCl in various NaCl solutions at 25° and 100°, respectively; and 0.66-0.70 and 2.04-2.15 for KCl in various KCl solutions at 25° and 100°, respectively. These experiments show that the thickness δ is proportional to η, and that the liquid in the surface layer is practically a saturated solution. The factor $kD_o/(D_o + k \cdot \delta\eta)$ does not remain constant when NaCl or KCl dissolves in various solutions of another salt because then the composition of the saturated solution near the crystal varies with the concentration of the foreign salt, e.g., this factor is at 25° 0.47 for NaCl in 5% $MgCl_2$ and 0.10 for KCl in 30% $MgCl_2$.

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